

WHAT IS CLAIMED IS:

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1. A fuel cell, comprising:

a membrane electrode assembly (MEA)

including a polyelectrolyte membrane having first
and second sides to which a fuel electrode and an
10 air electrode are joined, respectively;

a fuel electrode housing having an
internal face on which a fuel channel and a fuel-
side electrode film are formed; and

an air electrode housing having an air
15 passage formed therein, the air electrode housing
having an internal face on which an air-side
electrode film is formed,

wherein:

said fuel electrode housing is joined to
20 said MEA with the internal face thereof facing the
fuel electrode of said MEA so that the fuel-side
electrode film is electrically connected to the fuel
electrode; and

said air electrode housing is joined to
25 said MEA with the internal face thereof facing the
air electrode of said MEA so that the air-side
electrode film is electrically connected to the air
electrode.

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2. The fuel cell as claimed in claim 1,
wherein at least one of the fuel-side electrode film
35 and the air-side electrode film is curved toward a
corresponding one of the fuel electrode and the air
electrode.

3. The fuel cell as claimed in claim 2,
wherein the one of the fuel-side electrode film and
the air-side electrode film projects in a center
part thereof.

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4. The fuel cell as claimed in claim 1,
10 wherein each of the fuel-side electrode film and the
air-side electrode film is formed by plating an
electroless nickel plating undercoat with gold.

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5. The fuel cell as claimed in claim 1,
wherein the fuel-side electrode film and the air-
side electrode film are formed integrally with said
20 fuel electrode housing and said air electrode
housing, respectively, by insert molding.

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6. The fuel cell as claimed in claim 1,
wherein the fuel-side electrode film and the air-
side electrode film are deposited on said fuel
electrode housing and said air electrode housing,
30 respectively.

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7. The fuel cell as claimed in claim 1,
wherein the fuel-side electrode film and the air-
side electrode film are formed on said fuel

electrode housing and said air electrode housing,
respectively, by plating.

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8. The fuel cell as claimed in claim 1,
wherein the fuel-side electrode film and the air-
side electrode film are formed on said fuel
10 electrode housing and said air electrode housing,
respectively, by coating.

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9. The fuel cell as claimed in claim 1,
wherein:

a metal member is formed on at least one
of the fuel-side electrode film and the air-side
20 electrode film so as to be in contact with a
corresponding one of the fuel electrode and the air
electrode; and

the one of the fuel-side electrode film
and the air-side electrode film is electrically
25 connected to the corresponding one of the fuel
electrode and the air electrode by the contact of
said metal member with the corresponding one of the
fuel electrode and the air electrode.

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10. The fuel cell as claimed in claim 9,
wherein said metal member comprises a plurality of
35 projections.

11. The fuel cell as claimed in claim 9,
wherein said metal member comprises a metal mesh.

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12. The fuel cell as claimed in claim 9,
wherein said metal member comprises a plurality of
springs.

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13. The fuel cell as claimed in claim 1,
15 further comprising a packing provided between an
edge part of said fuel electrode housing and an edge
part of said air electrode housing,

wherein:

said fuel electrode housing and said air
20 electrode housing are fastened by a fastening
member; and

the edge parts of said fuel electrode
housing and the air electrode housing are sealed.

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14. The fuel cell as claimed in claim 1,
wherein an edge part of said fuel electrode housing
30 and an edge part of said air electrode housing are
sealed by ultrasonic welding.

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15. The fuel cell as claimed in claim 1,
wherein a plurality of vent holes are formed in said

air electrode housing so as to penetrate through the
air-side electrode film.

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16. The fuel cell as claimed in claim 1,
wherein the fuel channel of said fuel electrode
housing is formed of a plurality of fuel supply
10 channels that are formed by dividing a space that is
in contact with the fuel electrode of said MEA.

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17. The fuel cell as claimed in claim 16,
wherein the fuel supply channels have respective
openings communicating therewith for receiving fuel.

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18. The fuel cell as claimed in claim 1,
wherein at least one of said fuel electrode housing,
25 said air electrode housing, the fuel-side electrode
film, and the air-side electrode film is formed to
have a shape including a curved surface.

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19. The fuel cell as claimed in claim 1,
wherein the fuel cell is shaped so as to be
containable in a vacant space of an apparatus in
35 which the fuel cell is to be mounted.

20. The fuel cell as claimed in claim 1,
further comprising a fuel reservoir attached to said
fuel electrode housing so as to be detachable
therefrom.

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21. The fuel cell as claimed in claim 1,
10 further comprising a metal wire provided between an
edge part of said fuel electrode housing and an edge
part of said air electrode housing so as to be
electrically connected to the fuel-side electrode
film,

15 wherein the edge parts of said fuel
electrode housing and said air electrode housing are
sealed by welding.

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22. The fuel cell as claimed in claim 21,
wherein the metal wire is employed as an extension
electrode.

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23. The fuel cell as claimed in claim 1,
30 wherein the fuel channel is formed on the fuel-side
electrode film in said fuel electrode housing.

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24. A fuel cell stack, comprising:
a plurality of fuel cells as set forth in

claim 1,

wherein:

each fuel cell has a first extension
electrode electrically connected to the fuel-side
5 electrode film of said fuel electrode housing and
exposed therefrom through an opening, and a second
extension electrode electrically connected to the
air-side electrode film of said air electrode
housing and exposed therefrom through an opening;
10 and

the first extension electrode of a first
one of the fuel cells is electrically connected by
an engagement member to the second extension
electrode of a second one of the fuel cells adjacent
15 to the first one of the fuel cells, the engagement
member engaging the openings through which the first
and second extension electrodes are exposed,
respectively.

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25. A method of manufacturing the fuel
cell as set forth in claim 1, the method comprising
25 the steps of:

(a) providing a metal wire between an edge
part of the fuel electrode housing and an edge part
of the air electrode housing; and

(b) welding the edge parts of the fuel
30 electrode housing and the air electrode housing
together by heating the metal wire by causing an
electric current to flow therethrough.

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26. The fuel cell manufactured by the

method as set forth in claim 25,

wherein:

the metal wire is electrically connected
to the fuel-side electrode film; and

5 the metal wire is employed as an extension
electrode.

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27. A fuel cell, comprising:

a membrane electrode assembly (MEA)
including a polyelectrolyte membrane having first
and second sides to which a fuel electrode and an
15 air electrode are joined, respectively; and

a flexible substrate having a pair of
first and second conductor layers formed on a side
thereof,

20 wherein said flexible substrate is folded
to hold said MEA between the first and second
conductor layers opposing each other so that the
first and second conductor layers are connected to
the fuel electrode and the air electrode,
respectively, of said MEA.

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28. The fuel cell as claimed in claim 27,
30 wherein a pair of first and second extension
electrodes are formed on said flexible substrate so
as to extend from the first and second conductor
layers, respectively, the first and second extension
electrodes being extended outside a seal part of the
35 fuel cell in an assembled state, the seal part
sealing a main body of the fuel cell.

29. The fuel cell as claimed in claim 28,
wherein said flexible substrate comprises first and
second parts on which said first and second
extension electrodes, respectively, are formed so
5 that a pair of first and second conductive fastening
members are attachable to the first and second parts,
respectively, of said flexible substrate so as to be
electrically connected to the first and second
extension electrodes, respectively.

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30. The fuel cell as claimed in claim 28,
15 wherein said first and second electrodes are formed
so as to be connectable to another member by
soldering.

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31. The fuel cell as claimed in claim 27,
wherein a circuit pattern on which a device is
mountable is formed on said flexible substrate so as
25 to extend from the first and second conductor layers.

32. The fuel cell as claimed in claim 27,
30 wherein the first and second conductor layers are
formed to have unevenness.

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33. The fuel cell as claimed in claim 27,

wherein the first and second conductor layers are formed like meshes.

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34. The fuel cell as claimed in claim 27, wherein said flexible substrate is a flexible printed board.

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35. A fuel cell stack, comprising:
15 a plurality of connected fuel cells each including a membrane electrode assembly (MEA) including a polyelectrolyte membrane having first and second sides to which a fuel electrode and an air electrode are joined, respectively; and
20 a flexible substrate having a plurality of pairs of conductor layers formed on a side thereof, the pairs corresponding in number to said fuel cells, wherein said flexible substrate is folded to hold each MEA between the corresponding pair of
25 conductor layers opposing each other so that the conductor layers are connected to the fuel and air electrodes, respectively, of the MEA.

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36. The fuel cell stack as claimed in claim 35, wherein a connection electrode electrically connecting the fuel cells adjacent to
35 each other in an assembled state of the fuel cell stack is formed on said flexible substrate so as to extend from the corresponding conductor layers.

37. The fuel cell stack as claimed in claim 35, wherein said flexible substrate is a flexible printed board.